

Frozen state solutions are a critical product stage or end product in a variety of industries, including freeze drying, pharmaceuticals, food storage and biotech.

The Lyotherm3 combines electrical and thermal techniques. This unique dual analysis adds a new dimension to the data of this critical stage.

- **Impedance Analysis ($Z_{sin\phi}$)** is a fixed frequency dielectric analysis providing an indication of the sample tracks molecular mobility, including events not picked up by thermal methods like DTA or DSC
- **Differential Thermal Analysis (DTA)** measures the difference in temperature between a sample and a reference, highlighting exothermic and endothermic events e.g. crystallisation, eutectic melting and glass transitions

Combining DTA and Impedance analysis means Lyotherm is more sensitive to changes within the frozen structure than other exclusively thermal techniques.



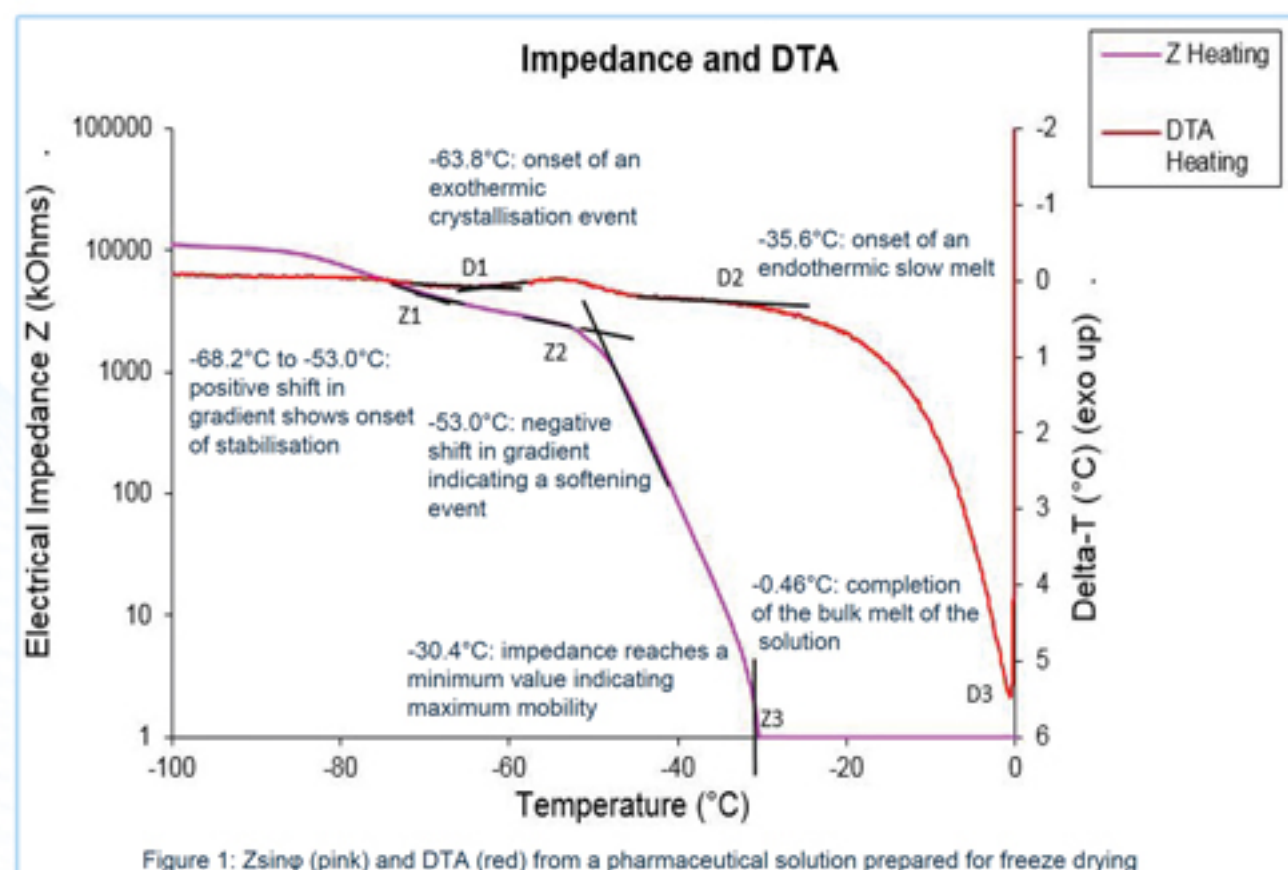
Benefits of using Lyotherm3

- Determines critical parameters of samples within the frozen state (T_g' , crystal transitions, T_{eu} , softening)
- Identifies viscosity changes within the frozen structure
- Optimised for frozen state analysis
- Typical analysis time: 1 hour
- Alarms and liquid nitrogen precision allow greater control over analysis
- Compact control unit and wiring design reducing benchtop footprint
- Simplified operation to increase reliability of results
- Most accurate analysis data available on the market
- Clear graph data and flexibility during post-analysis
- Simple data processing - exporting to Excel tailors the graph to the analysis
- On-site installation includes full training into operation and interpretation of results

To request more details or discuss your requirements further, please contact our specialists at
www.biopharmagroupcdmo.com

LYOTHERM3

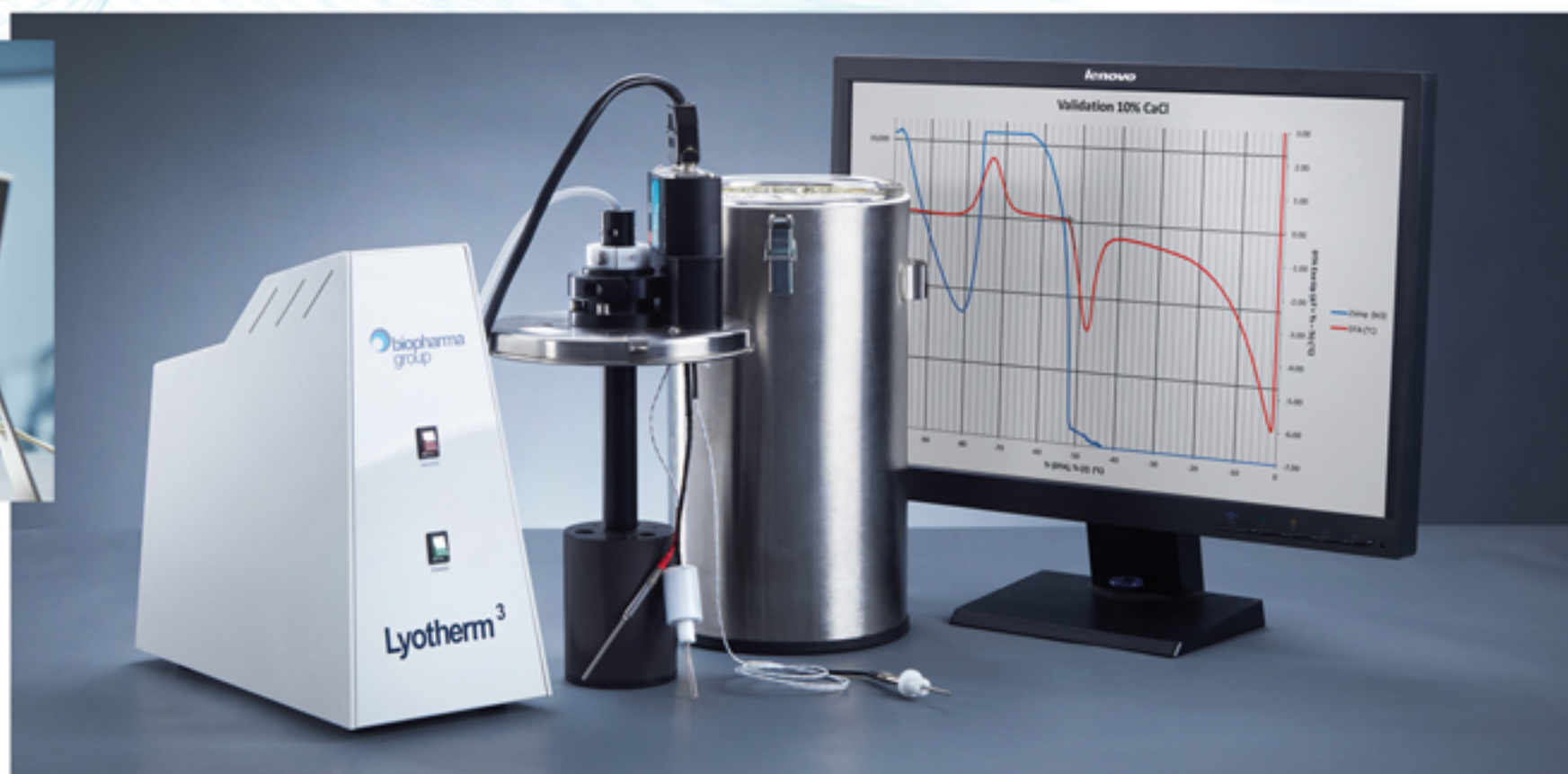
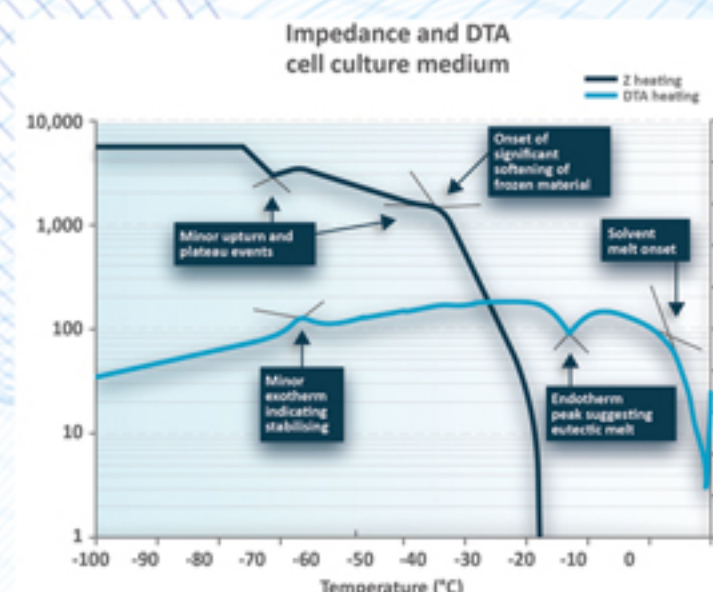
THE NEXT STEP IN FROZEN STATE SOLUTION ANALYSIS



As seen in Figure 1, the stabilisation shown in Zsinφ (Z1) is linked to the exothermic event in DTA (D1). The beginning of the melt for one of the solutes can be seen at -53.0°C (Z2) which reaches maximum mobility at -30.4°C (Z3), during which the slow melt of the bulk is initiated (D2) with the completion of the melt at -0.46°C (D3). While it would be possible to freeze dry this sample below -53.0°C it would be very slow, and therefore inefficient. Using the Lyotherm3 it is possible to provide evidence advising a reformulation of the solution.

Technical Specifications of Lyotherm3

- Sample volumes from 2ml - 4ml
- 2 Pt 100 temperature probes with accuracy of $\pm 0.3^{\circ}\text{C}$ at 0°C
- Temperature range for analysis -196°C to $+60^{\circ}\text{C}$
- Impedance probe operating between 1Ω - $14\text{M}\Omega$ at 1,000Hz
- Double insulated liquid nitrogen Dewar
- Reusable stainless steel sample holders
- 220/240V 50Hz or 120V 60Hz variable power supply
- Small bench-top footprint (approximately 500mm x 400mm)
- Exports directly to Excel
- Software allows for data collection, analysis, storage and reloading



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